CLAIMS

We Claim:

1. A method of passivating a laser discharge chamber, comprising:

forming a fluorine based plasma from one or more first gases, said first gases comprising a fluorine containing gas; and

reacting said fluorine based plasma with internal surfaces of said laser discharge chamber to passivate said internal surfaces.

2. The method of Claim 1 wherein said fluorine containing gas is a fluorine containing gas selected from the group consisting of NF_3, F_2, CF_4, SF_6, and mixtures thereof.

3. The method of Claim 1 wherein forming said fluorine based plasma comprises:

flowing said first gases into a plasma source external to said laser discharge chamber, said fluorine containing gas flowing at a flow rate of about 5 standard cubic centimeters per minute (sccm) to about 25 sccm;

applying a radio frequency signal to said first gases to form said fluorine based plasma in said plasma source; and

flowing said fluorine based plasma into said laser discharge chamber.

4. The method of Claim 3 wherein applying said radio frequency signal to said first gases comprises inductively applying said radio frequency signal to said first gases.

5. The method of Claim 1 wherein forming said fluorine based plasma comprises:

flowing said first gases into said laser discharge chamber, said fluorine containing gas flowing at a flow rate of about 5 sccm to about 25 sccm; and

applying a radio frequency signal to said first gases to form said fluorine based plasma in said laser discharge chamber.

6. The method of Claim 1 wherein reacting said fluorine based plasma with internal surfaces of said laser discharge chamber comprises reacting said fluorine based plasma with said internal surfaces for a first period of time of about 0.5 hours to about 2.0 hours.

7. The method of Claim 6 further comprising selecting said first period of time by determining a fluorine plasma reaction endpoint.

8. The method of Claim 6 further comprising maintaining a pressure in said laser discharge chamber of about 100 millitorr to about 1.5 torr for said first period of time.

9. The method of Claim 1 further comprising maintaining a temperature of said discharge chamber of about 50°C to about 100°C.

10. The method of Claim 1 further comprising flowing said fluorine based plasma through said laser discharge chamber and out of a discharge chamber exit port.

11. The method of Claim 1 wherein said first gases comprise an oxygen containing gas.

12. The method of Claim 1 further comprising:

forming an oxygen based plasma from one or more second gases, said second gases comprising an oxygen containing gas; and

reacting said oxygen based plasma with said internal surfaces of said laser discharge chamber to clean said internal surfaces.

13. The method of Claim 12 wherein said oxygen containing gas is an oxygen containing gas selected from the group consisting of O_2, N_2O, and mixtures thereof.

14. The method of Claim 12 wherein forming said oxygen based plasma comprises:

flowing said second gases into a plasma source external to said laser discharge chamber, said oxygen containing gas flowing at a flow rate of about 10 sccm to about 50 sccm;

applying a radio frequency signal to said second gases to form said oxygen based plasma in said plasma source; and

flowing said oxygen based plasma into said laser discharge chamber.

15. The method of Claim 14 wherein applying said radio frequency signal to said second gases comprises inductively applying said radio frequency signal to said second gases.

16. The method of Claim 12 wherein forming said oxygen based plasma comprises:

flowing said second gases into said laser discharge chamber, said oxygen containing gas flowing at a flow rate of about 10 sccm to about 50 sccm; and

applying a radio frequency signal to said second gases to form said oxygen based plasma in said laser discharge chamber.

17. The method of Claim 12 wherein reacting said oxygen based plasma with internal surfaces of said laser discharge chamber comprises reacting said oxygen based plasma with said internal surfaces for a second period of time of about 0.5 hours to about 2.0 hours.

18. The method of Claim 17 further comprising selecting said second period of time by determining an oxygen plasma reaction endpoint.

19. The method of Claim 17 further comprising maintaining a pressure in said laser discharge chamber of about 100 millitorr to about 1.5 torr for said second period of time.

20. The method of Claim 12 further comprising flowing said oxygen based plasma through said laser discharge chamber and out of a discharge chamber exit port.

21. An apparatus for passivating a laser discharge chamber, comprising:

a source of one or more gases, said source of gases coupled to said laser discharge chamber, said gases comprising a fluorine containing gas;

a source of a radiofrequency signal;

an antenna electrically coupled to said source of a radiofrequency signal, whereby said radiofrequency signal is applied to said gases to form a plasma.

22. The apparatus of Claim 21 wherein said fluorine containing gas is a fluorine containing gas selected from the group consisting of NF_3, F_2, CF_4, SF_6, and mixtures thereof.

23. The apparatus of Claim 21 wherein said gases comprise an oxygen containing gas.

24. The apparatus of Claim 23 wherein said oxygen containing gas is an oxygen containing gas selected from the group consisting of O_2, N_2O, and mixtures thereof.

25. The apparatus of Claim 21 wherein said radiofrequency signal is of a frequency of about 13.56 MHz and of a power of about 100 Watts to about 600 Watts.

26. The apparatus of Claim 21 wherein said antenna is a laser discharge chamber electrode internal to said laser discharge chamber.

27. The apparatus of Claim 21 further comprising a plasma source external to said laser discharge chamber, said plasma source coupled to said source of gases and coupled to said laser discharge chamber, said antenna internal to said plasma source.

28. The apparatus of Claim 27 wherein said antenna is inductively coupled to said gases.

29. The apparatus of Claim 21 further comprising a mass flow controller coupled to said source of gases and coupled to said laser discharge chamber, whereby a flow rate of said gases is regulated.

30. The apparatus of Claim 21 further comprising a pressure control valve, a pressure gauge, and a vacuum pump, said pressure control valve coupled to said laser discharge chamber and coupled to said vacuum pump, said pressure gauge coupled to said laser discharge chamber.

31. The apparatus of Claim 30 further comprising a controller for controlling said source of a radiofrequency signal, said source of gases, and said pressure control valve.

32. The apparatus of Claim 21 further comprising a heater in contact with said laser discharge chamber.

33. The apparatus of Claim 21 further comprising a residual gas analyzer coupled to said laser discharge chamber, whereby a plasma reaction endpoint is determined.

34. The apparatus of Claim 21 further comprising an optical monitor coupled to said laser discharge chamber, whereby a plasma reaction endpoint is determined.

35. The apparatus of Claim 21 further comprising an impedance matching network electrically coupled to said source of a radiofrequency signal, and electrically coupled to said antenna.